**Vibrating coils magnetometer: critical current evaluation in REBCO tapes**

**at various temperatures**

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**Introduction**

High temperature superconducting (HTS) wires (Bi-2212) and tapes (REBCO, Bi-2223) capable of carrying high critical currents (Ic) while in high magnetic fields background are paramount for all-superconducting high-field magnet technology advance. As Ic is the key parameter for tapes’ performance, its characterization in high field by reliable and versatile methods is mandatory. Systematic mapping of is crucial also for understanding both vortex pinning and quench mechanisms. However, the high *Ic* values of many conductors makes measurement challenging, especially for off-axis measurements where large torques are present. We developed a Vibrating Coils Magnetometer (VCM) for contact-free magnetization measurements as a function of angle between sample and background field (B), B strength, and temperature (T). The sample can be rotated by 360o around the B direction in up to 31 T magnetic field, while the sample temperature can be stabilized at up to 100K with less than 0.05K variation during measurements.

**Experimental**

The pick-up coils movement is driven by a piezoelectric actuator. We use two heaters to vary the temperature up to 100 K with great stability. One heater is placed close to the sample, directly on the sample rotator, while the second is wrapped around the sample space and kept 10 K lower than the desired temperature.

**Results**



Figure 1 (a) Magnetization loops from VCM in REBCO conductor at various temperatures. b) lines: Ic extracted from VCM data (Ic ~ V+-V-) compared to transport data (symbols) by adjustment in one point (10 T, 20 K)

**Conclusions**

VCM magnetization raw data provide *Ic* values in good agreement with the measured transport *Ic* values (Fig.1 a). Our VCM provides complementary data to 4-probe transport critical current to complete the characterization of highly anisotropic materials at low T and B, and at high angle and high B, regimes in which transport techniques fail often due to high Ic related experimental issues. As a final note, VCM measurements consume, in average, less than 20% of the LHe required for transport measurements.

**Acknowledgements**

This work was performed as UCGP project at the National High Magnetic Field Laboratory, which is supported by National Science Foundation Cooperative Agreement No. DMR-1157490, the State of Florida, and the U.S. Department of Energy.